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(54) A low fat mayonnaise product and method for making the same.

(57) A low fat mayonnaise product which has an edible oil content of less than 10% by weight, which further comprises water, egg white, microcrystalline cellulose and polydextrose, and a process for producing the product.

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Mayonnaise is a thick, emulsified food dressing generally prepared from vegetable oil, water, egg yolk-containing materials and acidifying ingredients. The United States Food and Drug Administration (USFDA) regulations set forth the standards which a mayonnaise product must meet, including a requirement of at least 65% by weight vegetable oil. However, over the past few years, numerous products have come out on the market expanding the scope of products recognized by the general public as mayonnaise products. Such products include mayonnaise products designated as cholesterol-free and low calorie or light mayonnaise and salad dressings. These mayonnaise products contain levels of oil and egg yolk-containing materials which do not meet the current Standard of Identity for mayonnaise as promulgated by the USFDA. These products may also contain additional ingredients, such as cooked starch paste as a thickening agent, which are not currently recognized as standard ingredients for mayonnaise. In this application, the term "mayonnaise product" is not meant to be limited to those products which meet the current USFDA Standard of Identity, but is meant to encompass all spoonable dressing products which are recognized by the general public as mayonnaise or spoonable salad dressing products.

In today's health conscious environment, there is a need for low or no fat mayonnaise products. A problem to overcome in order to produce no fat mayonnaise products is the removal of the vegetable oil from the products, while maintaining similar product taste and texture. As the oil is present in levels of at least 65% by weight in conventional mayonnaise products and about 30 to 60% by weight in light or low calorie products, substantial reformulation is necessary in order to produce a mayonnaise product with less than 5% by weight vegetable oil.

## 20 DESCRIPTION OF RELATED ART

U.S. Patent No. 2,944,906 to Spitzer discloses and claims a mayonnaise-like food product with a relatively low caloric content. The mayonnaise-like product has water as its principle component, and includes from 5.0 to 30.0% by weight edible oil, and a combination of a stiff and a soft gum to produce a product with the desired texture. Additionally, Spitzer requires the use of an egg yolk containing material as an emulsifying agent. The process disclosed in Spitzer for the production of the food product is a hot mix process to form a gel, which is then broken down into an oil in water emulsion of fine particle size.

U.S. Patent No. 3,023,104 to Battista discloses and claims reduced calorie food compositions, including a mayonnaise type salad dressing. The food compositions comprise a food material, and, as a non-nutritive agent, cellulose crystallite aggregates, which are a product of acid hydrolysis of cellulose. The cellulose crystallite aggregates are bland in taste and odor, have a smooth mouth feel, and have a physical appearance resembling starch. They are particularly well suited as a substitute for starch in baked products.

Rispoli et al., in U.S. Patent No. 4,308,294 disclose and claim an oil-free, oil-replacement composition which has an oily mouth feel, texture and lubricity, and which may be used to form a salad dressing product. The composition is formed by hydrating and whipping a protein and cellulose gum to form a protein phase; hydrating an acid stable modified starch and an acid to form an acid phase; subjecting the acid phase to heat to swell the starch; and mixing the protein phase and the acid phase.

In U.S. Patent No. 4,923,707 to Schoenberg, a method is taught for producing a low oil mayonnaise product. The claimed process, and the product therefrom, contains an edible oil at a level of from 65% to 72% by weight, and includes a low D.E. corn syrup at a level of from 4 to 15% by weight. The product further contains water at a level of from 5 to 15% and egg yolk as the emulsifier in an amount of from 4 to 8% by weight. The mayonnaise is prepared by adding water and the egg yolk to the low D.E. corn syrup to form a premix, combining the premix with the oil and an edible acid to form a mayonnaise product, and processing the mayonnaise product under conditions of high shear.

It has now been found that an acceptable low fat mayonnaise product can be made containing less than 5% by weight edible oil.

## SUMMARY OF THE INVENTION

The present invention relates to a low fat mayonnaise product which contains less than 10% by weight edible oil, and a process for making the product. The product comprises water, egg whites, microcrystalline cellulose and polydextrose which, when properly combined, create a product which has the organoleptic and rheological attributes comparable to a conventional mayonnaise product. A no fat mayonnaise product is also taught which comprises the same ingredients as the low fat mayonnaise, but with no edible oil.

A process for the production of the mayonnaise products is also disclosed herein. Four premixes are prepared separately; one is a blend of dry ingredients and water, the second is the combination of microcrystalline cellulose and water, the third is a combination of gums, preferably xanthan gum, and water,

and the fourth is a combination of water, egg white, whey protein concentrate, if present, and any added flavors or colors. The four premixes and any additional ingredients are mixed together to form a slurry, which is then subjected to a continuous cooking and cooling system. The cooked and cooled product is pumped through a milling device just prior to being sent through the filling apparatus for packaging.

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#### DETAILED DESCRIPTION

A low fat mayonnaise product is taught which comprises edible oil in an amount of less than 10% by weight. An alternate embodiment of this invention is a no fat mayonnaise product which does not include 10 any edible oil. As previously stated in this application, the term "mayonnaise product" is being used herein to define a product which has the look and feel of a mayonnaise or spoonable salad dressing product to the general public, but which does not necessarily meet the current Standard of Identity of a mayonnaise or salad dressing product as promulgated by the USFDA.

The low fat mayonnaise product of the present invention uses a combination of a number of ingredients 15 to replace the oil which is not present in the product. The main component of the low fat mayonnaise product is water, which is present in levels of from about 40 to about 90% by weight of the product, preferably from about 51 to about 85% by weight, with an optimal range of from about 60 to about 78% by weight.

In addition to the water, proteins, such as egg whites and whey protein concentrate, are present in the 20 low fat mayonnaise product. The level of the protein must be carefully balanced in order to produce a product with an acceptable texture and flavor. Where both egg whites and whey protein concentrate are present, the egg whites should be present in an amount of from about 1.0 to about 20% by weight of the product, preferably about 1.0 to about 10% by weight, and the whey protein concentrate should be present in an amount of up to about 10% by weight of the final product. The preferred level of protein, i.e. the total 25 amount of egg whites and whey protein concentrate, is at a level of from about 1 to about 12% by weight of the final product.

The use of proteins outside the ranges designated herein results in an unacceptable product. If the level of protein is too high, the resulting product becomes too stiff and rubbery or too thick.

Another important aspect of the low fat mayonnaise product is the inclusion of microcrystalline cellulose 30 to control the consistency. The microcrystalline cellulose should be present in levels of from about 0.25 to about 5% of the product. At these levels, the microcrystalline cellulose imparts a thixotropic consistency and spreadability without any added gumminess, which is usually associated with the use of microcrystalline cellulose at higher levels.

It is common in commercial sources of microcrystalline cellulose, for a hydrocolloid such as sodium 35 carboxymethyl cellulose or protective colloids such as gum to be present. The hydrocolloid is necessary to prevent aggregation or flocculation of the colloidal microcrystalline cellulose particles, and may therefore be present in the mayonnaise product.

To provide a low fat mayonnaise product with acceptable body, polydextrose is a recommended 40 ingredient. In addition to the polydextrose, maltodextrin and a modified food starch may be included to result in a high quality, low fat mayonnaise product.

The optimal balance of the polydextrose, maltodextrin and modified food starch is important for providing a creamy, smooth body and lubricity which is associated with a conventional mayonnaise product. An improper balance of these three ingredients can result in a product which exhibits a pudding-like texture and is a cuttable instead of a spoonable mixture. If the modified food starch or the maltodextrin are used at 45 levels which are too high, the resulting product will be too pasty and grainy. Too much polydextrose results in products with increased browning and the potential for off-flavor development.

If present, the polydextrose should be in an amount of from 1.0 to about 15% by weight, preferably at a level of from about 3.0 to about 8.0% by weight. The use of maltodextrin in the product has the added benefit of decreasing the breakdown rate of the product in the mouth, which is typical in a true mayonnaise 50 product. The maltodextrin should be a low D.E., such as 10 D.E., and should be present in a level of from about 0.5 to about 7.5% by weight, preferably about 2.0 to about 5.0%. The D.E. designation is the amount of reducing sugar present on a dry basis, when calculated as dextrose. The modified food starch should be present at a level of from about 2.0 to about 10% by weight, preferably about 4.0 to about 6.0% by weight.

Additional components which may be added are an edible oil and an acidifying agent. In the low fat 55 mayonnaise product, edible oil may be added at levels of up to about 10% by weight, preferably not more than about 2% by weight. Obviously, if a no fat mayonnaise product is desired, no edible oil will be added. The oils which can be added are those generally used in mayonnaise products, typically vegetable oils such as corn oil, soybean oil, sunflower oil and cottonseed oil. The acidifying agent can be any edible acid,

such as citric acid, acetic acid or mixtures thereof. Generally, the acidifying agent is acetic acid which is present in the form of vinegar, or citric acid in the form of lemon or lime juices.

Further optional ingredients may be included, such as gums, flavors, colors and preservatives. Ingredients which are generally included in conventional mayonnaise formulas, such as salt, sugar and additional flavorings and spices and preservatives are also added to the low fat and no fat mayonnaise products.

A low fat salad dressing type product could also be produced using the basic teaching of this invention. In order to result in what would be known to the general public as a low fat spoonable salad dressing product, the amount of whey protein concentrate in the product would be at a level of no more than 8% by weight, the level of microcrystalline cellulose used would be at the lower end of the designated range, and there would be a change in the flavorings, such as an increase in the amount of sugar used.

The low fat or no fat mayonnaise products are made by the same procedure. The initial step in the process is the formulation of three or four premixes: a) a bulk dry ingredient blend premix; b) a microcrystalline cellulose premix; c) a gum and water premix; and d) a whey and/or egg premix. The bulk dry ingredient blend premix is defined as comprising any dry ingredients, except of course those specifically mentioned in one of the other premixes. Therefore, it would include polydextrose and any additional dry components such as modified food starch, maltodextrin, gums and water. The dry ingredients are preblended and then combined with water on a continuous basis.

Premix B comprises a blend of microcrystalline cellulose and water. The ingredients are combined in a powder/water dispersing device and the resulting mixture is then pumped directly and continuously through a milling device, preferably a colloid mill. The gap on the mill is preferably between about 6 to about 12 thousandths of an inch. The milling action is critical in order to form a uniform dispersion of the microcrystalline cellulose.

The third premix is the optional premix and is a combination of a protective colloid, such as xanthan gum, guar gum or combinations thereof and water. Preferably, this premix is a combination of xanthan gum and water and its purpose is to prevent flocculation and insure proper dispersion of the microcrystalline cellulose. When used, this premix is combined with Premix B after Premix B is subjected to milling; and prior to being mixed with the other premixes.

The fourth premix is comprised of liquid egg whites, salt, flavors, colors and whey protein concentrate, when appropriate. The ingredients are combined in a refrigerated tank which has stirring means.

The premixes are then added to a slurry make-up tank, with any additional ingredients such as sugar, oil, oil soluble flavors and colors and preservatives. The acidifying agent is also added directly to the slurry make-up tank, as the final ingredient. The ingredients are then blended for a period of at least 5 minutes. After the slurry is blended, it is pumped to a continuous cooking and cooling system. The slurry is heated via steam jacketed swept surface heat exchangers to a temperature in the range of from about 175° F to about 200° F, where it is held for a period of from about 15 to about 75 seconds. The cooked slurry is then cooled to 70° F in a series of swept surface heat exchangers. The cooled product is then held in a non-jacketed and non-agitated tank until required on the packaging line. The product is then pumped through a milling device, preferably a colloid mill prior to being routed to the filling apparatus.

An alternate process can be used when making a low fat mayonnaise product which would change the point of addition of some of the gums being added. Any gums which would be part of the bulk dry ingredient premix, can alternately be mixed with the oil, and the resulting mixture would be added directly to the slurry make-up tank. This does not apply to any gums which are used as protective colloids and form optional Premix C.

Incorporated in this procedure are a number of noteworthy features, such as the ability to cook the entire mixture, including the egg whites. This is contrary to a process for a true mayonnaise product where the egg portion is not cooked. It is preferable to cook the entire mixture in order to get a product with an acceptable texture. Other important features of this process are the milling steps, and the inclusion of Premix C when possible. As previously stated, the milling of the microcrystalline cellulose is necessary in order to form a uniform dispersion. The function of Premix C is important for good dispersion and prevention of subjecting the microcrystalline cellulose to acids or salts before it is protected by the gums. Therefore, when possible this additional premix should be formulated and combined with Premix B prior to incorporation in the slurry make-up tank.

The final milling step smooths out the product resulting in a visually smoother, less gritty appearance and a "fattier" texture. This final milling step is similar to a full fat mayonnaise process, but differs from a so-called light mayonnaise process which may not require milling.

The following examples further illustrate various features of the invention, but are intended to in no way limit the scope of the invention which is described in the appended claims.

## EXAMPLE 1

A low fat mayonnaise product was produced by forming the following three premixes:

	<u>Premix A</u>	<u>% by weight</u>
	Polydextrose	10.00
10	Modified food starch	5.00
	gums	0.30
	water	30.00
	 <u>Premix B</u>	
15	Avicel	1.20
	water	25.00
20	 <u>Premix C</u>	
	Whey protein concentrate, dry basis	4.00
25	Egg white	6.00
	flavors, colors	2.00
	water	5.50

Premix A was prepared by placing all the ingredients except water in a ribbon blender. After mixing, the  
 30 water and blend were combined on a continuous basis in a powder/water dispersing apparatus. The premix  
 was then pumped to a slurry tank. Premix B was formed by combining Avicel (a blend of microcrystalline  
 cellulose and sodium carboxymethyl cellulose from FMC Corporation, Philadelphia, PA) and water in a  
 powder/water dispersing device. The mixture was then pumped directly and continuously through a colloid  
 mill at a rate of 40 to 50 gallons per minute, through a mill gap between 7 and 10 thousandths of an inch.  
 35 The mixture was then pumped to the slurry tank, simultaneous with Premix A.

Premix C was formed by combining all the ingredients batchwise in a refrigerated, well stirred tank,  
 where they were held until required. They were then pumped to the slurry tank after Premixes A and B had  
 begun to be added to said slurry tank.

The remaining ingredients, 3.00% sugar, additional flavors and preservatives, and 2.00% vegetable oil  
 40 were added directly to the slurry tank. The 6.0% vinegar was added to the slurry tank last. The slurry was  
 then mixed for a period of about 10 minutes. Thereafter, the slurry was pumped to a holding tank and from  
 there to a continuous cooking and cooling system. The slurry was heated via steam jacketed swept surface  
 heat exchangers from ambient temperatures to 200° F. It was then held at this temperature for 30 - 40  
 45 seconds in an insulated holding tube. The product was then cooled from 200 to 70° F in a series of swept  
 surface heat exchangers, cooled first by chilled water, then by a standard refrigerant. The cooked and  
 cooled product was then held in a non jacketed and non agitated tank until it was required at the packaging  
 line. From this tank, the product was pumped through a colloid mill (gap between 10 and 30 thousandths of  
 an inch) and then to the required filling apparatus.

The low fat mayonnaise product which resulted exhibited acceptable texture and taste qualities.

## 50 EXAMPLE 2

A low fat mayonnaise product was made following the process in Example 1 but which further  
 comprised a low D.E. maltodextrin in Premix A. The three premixes were made up as follows:

<u>Premix A</u>	<u>% by weight</u>
Polydextrose	6.00
Modified food starch	6.00
Maltodextrin (15 D.E.)	1.00
gums	0.30
water	25.00

Premix B

Avicel	1.25
water	24.75

Premix C

Whey protein concentrate, dry basis	5.00
Egg white	11.00
flavors, colors	2.00
water	2.00

The remaining ingredients were 5.50% sugar, 2.00% vegetable oil and 5.0% vinegar, as well as additional flavors and preservatives.

The resulting low fat mayonnaise product was judged to have acceptable organoleptic qualities.

## EXAMPLE 3

The process of Example 1 was followed but a no fat mayonnaise product was produced. Premix C contained no whey protein concentrate and no edible oil was added. The total amount of water increased by about 4.0%, with a slight (less than 0.5%) increase in egg white content. The resulting no fat mayonnaise product exhibited acceptable texture and taste properties.

## EXAMPLE 4

A low fat salad dressing product was made following the process set out in Example 1 but with the following ingredients.

<u>Premix A</u>	<u>Salad Dressing</u>
Polydextrose	9.5
Modified Food Starch	5.0
Gums	0.3
Water	30.0

Premix BSalad Dressing

5	Avicel	0.5
	Water	25.0

Premix C

10	Whey Protein Concentrate (Dry Base)	6.0
	Egg White	4.0
	Flavor, Colors	2.2
15	Water	5.0

Additional Ingredients

20	Vinegar	5.0
	Sucrose	5.5
	Oil	2.0

The resulting product was found to exhibit textual qualities similar to the low fat mayonnaise products,  
25 but with a taste more characteristic of a salad dressing product.

## EXAMPLE 5

A low fat mayonnaise product was made containing the following ingredients:

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Premix A% by weight

35	modified food starch	6.0
	Polydextrose	5.0
	Maltodextrin (15 D.E.)	3.0
	guar gum	0.1
	water	17.7

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Premix B

45	Avicel	0.5
	water	27.0

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Premix C                    % by weight

xanthan gum	0.20
water	9.00

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Premix D

protein	6.0
flavors, colors	4.0
water	11.0

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Additional Ingredients

sugar	4.0
vinegar	4.5
oil	2.0

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The process of Example 1 was followed except that an additional premix, Premix C, was formulated. After milling Premix B, it is combined in a mixer with Premix C and then the combination is pumped to a slurry tank, simultaneous with Premix A.

25         The resultant low fat mayonnaise product exhibited good taste and texture qualities.

**Claims**

1. A low fat mayonnaise product comprising less than 10% by weight edible oil, water, egg white, microcrystalline cellulose and polydextrose.
2. The low fat mayonnaise product of claim 1 wherein the egg white is present in an amount of from about 1 to about 20% by weight.
3. The low fat mayonnaise product of claim 1 which further comprises whey protein concentrate in an amount up to 10% by weight.
4. The low fat mayonnaise product of claim 1 wherein the microcrystalline cellulose is present in an amount of about 0.25 to about 5% of the total product.
5. The low fat mayonnaise product of claim 1 which further comprises from about 0.5 to 7.5% maltodextrin.
6. The low fat mayonnaise product of claim 1 which comprises from 1.0 to 15% polydextrose.
7. The low fat mayonnaise product of claim 1 which further comprises from about 2.0 to about 10% modified food starch.
8. The low fat mayonnaise product of claim 1 which further comprises an acidifying agent.
9. A low fat mayonnaise product which comprises from about 1.0 to about 4.0% added edible oil, from about 40 to about 90% water, from about 1.0 to about 15% egg white, from about 0.5 to about 4.0% whey protein concentrate, from about 0.2 to about 3.5% microcrystalline cellulose, from about 2.0 to about 5.0 maltodextrin, from about 2.0 to about 6.0% modified food starch, and from about 2.0 to about 10% polydextrose.
10. The low fat mayonnaise product of claim 9 which further comprises an acidifying agent.

11. The low fat mayonnaise product of claim 10 which further comprises flavorings, colors, and preservatives.
12. A no fat mayonnaise product with no edible oil which comprises water, egg white, microcrystalline cellulose and polydextrose.  
5        13. The no fat mayonnaise of claim 12 which further comprises whey protein concentrate.
14. The no fat mayonnaise of claim 12 which further comprises modified food starch.  
10        15. The no fat mayonnaise of claim 12 which further comprises maltodextrin.
16. The no fat mayonnaise of claim 12 wherein the egg white is present in an amount of from 1.0 to about 20% by weight.  
15        17. The no fat mayonnaise of claim 12 wherein the whey protein concentrate is present in an amount up to 10% by weight.
18. A low fat mayonnaise product comprising less than 10% by weight edible oil, water, egg white, microcrystalline cellulose and polydextrose.  
20        19. A low fat salad dressing product comprising no more than 10% by weight edible oil, water, egg white, whey protein concentrate, microcrystalline cellulose and polydextrose.
- 25        20. A process for the production of a low fat or no fat mayonnaise product which comprises forming three premixes:
  - a) dry ingredients and water;
  - b) microcrystalline cellulose and water; and
  - c) egg white and water;  
30        combining the premixes a, b and c and additional components in a mixing tank to form a slurry; mixing for a period of at least about 5 minutes; heating the slurry to a temperature of about 175°F to about 200°F for a period of about 15 to about 75 seconds; cooling the slurry to about 70°F and then pumping the slurry through a milling device.
- 35        21. The process of claim 20 wherein premix b is pumped through a milling device prior to being combined with premixes a and c.
22. The process of claim 20 or 21 wherein the mill is a colloid mill.
- 40        23. The process of claim 20 which further comprises premixing gums with vegetable oil and adding the resulting mixture directly to the mixing tank with premixes a, b and c to form a slurry.
24. A process for the production of a low fat mayonnaise product which comprises forming three premixes:
  - a) dry ingredients and water;
  - b) microcrystalline cellulose and water; and
  - 45        c) whey protein concentrate, egg white and water;  
combining the premixes a, b and c and additional components in a mixing tank to form a slurry; mixing for a period of at least about 5 minutes; heating the slurry to a temperature of about 175°F to about 200°F for a period of about 15 to about 75 seconds; cooling the slurry to about 70°F and then  
50        pumping the slurry through a milling device.
25. The process of claim 24 wherein premix b is pumped through a milling device prior to being combined with premixes a and c.
- 55        26. A process for the production of a low fat or no fat mayonnaise product which comprises forming four premixes:
  - a) dry ingredients and water;
  - b) microcrystalline cellulose and water;

- c) colloid gum and water; and
- d) protein and water;

5 combining Premixes B and C to form Premix E, and then combining Premixes A, D and E in a mixing tank to form a slurry; mixing for a period of at least 5 minutes; heating the slurry to a temperature of about 175° F to about 200° F for a period of about 15 to about 75 seconds; cooling the slurry to about 70° F and then pumping the slurry through a milling device.

27. The process of claim 26 wherein Premix B is pumped through a milling device prior to being combined with Premix C.

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## EUROPEAN SEARCH REPORT

Application Number

EP 91 11 6163

### DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	EP-A-0 340 035 (KRAFT INCORPORATED) * page 5, line 25 - line 28; claims 7,20,22,25-28,37,39,44; examples 11,12,16-18 * * page 6, line 17 - line 20 * * page 19, line 30 - line 40 * * page 22, line 20 - page 23, line 19 * ----	1-5,7-19	A23L1/24 A23L1/308 A23L1/0534 A23L1/0522
Y	EP-A-0 301 440 (THE NUTRASWEET COMPANY) * claims 1,14,24; example 6 * ----	1-5,7-19	
A	US-A-4 431 681 (E. HEGEDUS ET AL) * column 3, line 7-14; claims 1,4,6,8,9; example 1 * * column 4, line 23-31, line 63-64 * ----	2,4,6	
A	EP-A-0 380 225 (PFIZER INC.)  * page 2, line 37 - line 39; claims 1,4,5,8; examples 1,16 * ----	1,4,8, 10,11	
A,D	US-A-2 944 906 (SPITZER) * column 2, line 39 - line 51; claims 1-6; examples 1-5 * * column 4, line 5-15 * * column 4, line 74 - column 5, line 19 * * column 5, line 24 - line 30 * ----	20,23,26	TECHNICAL FIELDS SEARCHED (Int. Cl.5)  A23L
A,D	US-A-3 023 104 (BATTISTA)  * column 5, line 37 - line 39; claims 1,5; example 13 * * column 6, line 44 - line 46 * * column 8, line 40 - line 46 * * column 10, line 40 - line 43 *  ----	21,22, 25,27	
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	24 FEBRUARY 1992	KANBIER D.T.	
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